IEEE 1547 Body of Standards Development - Status

NREL Testing to Validate Testing Protocols for DER Interconnection

Information provided by
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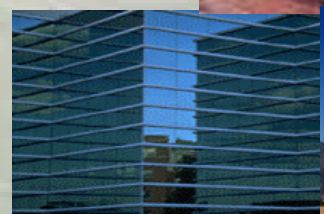



DER Technology Portfolio

Examples

Advanced Turbines

Reciprocating Engines

Fuel Cells

Photovoltaics

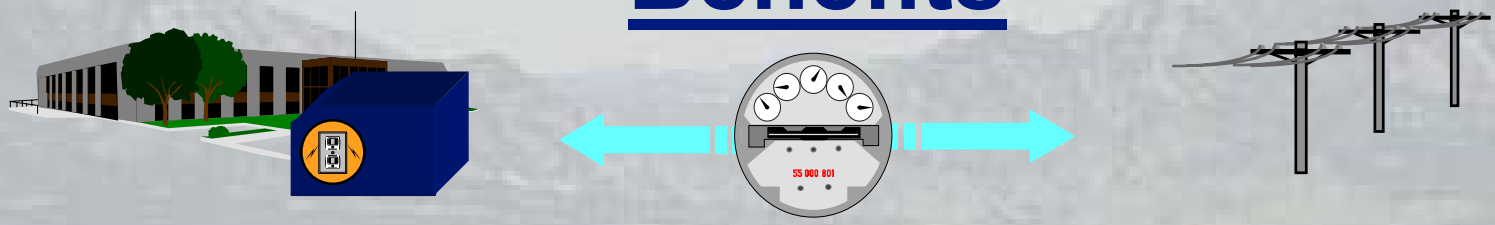
Wind

Thermally Activated Technologies

Microturbines

NREL

Interconnection Opportunities and Benefits



Potential Consumer Benefits

- Clean energy
- Lower cost electricity
- Reduced price volatility
- Greater reliability and power quality
- Energy and load management
- Combined Heat and Power

Potential Supplier Benefits

- Reduced electric line loss
- Reduced T&D congestion
- Grid investment deferment and improved grid asset utilization
- Improved grid reliability
- Ancillary services, e.g., voltage support and stability, VARs, contingency reserves, and black start capability

➔Greater flexibility and energy security←

Customer choice, open market access, time of use pricing, and easy interconnection is required to achieve these benefits

Policy and Market Mechanisms

IEEE Interconnection Standards

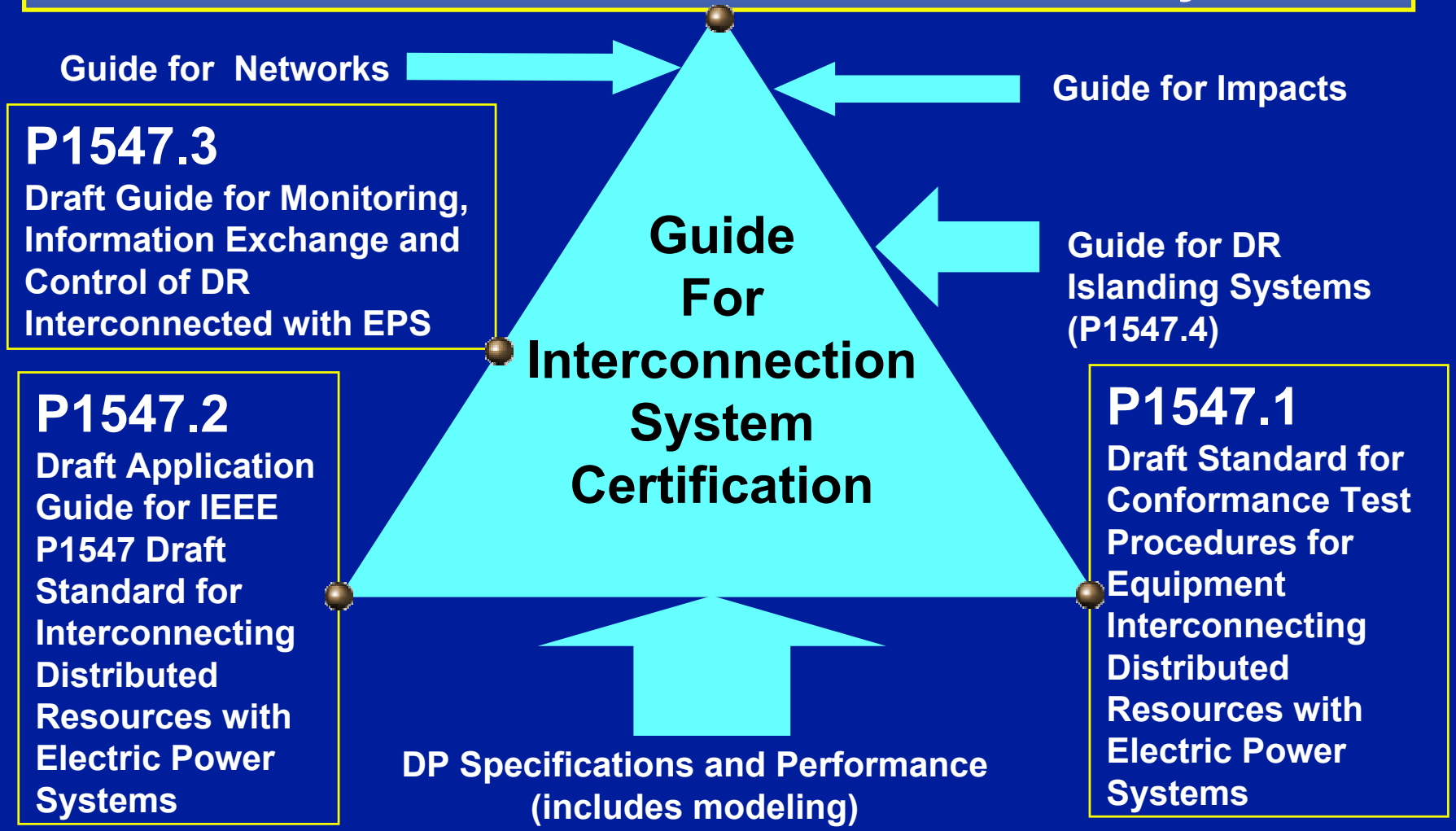
- Being developed by IEEE Standards Coordinating Committee 21 (IEEE SCC21)
- SCC 21 responsible for standards development in areas of
  - Fuel cells
  - Photovoltaics
  - Dispersed generation
  - Energy storage
- 400 SCC21 work group members (all work groups)
- SCC21 developing P1547 Series of Interconnection Standards -- IEEE1547 Affirmed by IEEE P1547 Ballot Group and Approved by the IEEE Standards Board June 12, 2003

IEEE 1547 Standard Status

- Affirmative IEEE Ballot -- February 2003
  - Voting Membership
    - 230 members (31% general interest, 4% government, 30% producer, 35% user)
    - 91% affirmatives
    - **Approved by IEEE Standards Board 6/12/03**
- IEEE Std. 1547 Published -- July 28, 2003

IEEE SCC21 1547 Series of Interconnection Standards

IEEE Std 1547™ (2003) Standard for Interconnecting Distributed Resources with Electric Power Systems



The above identifies existing IEEE SCC21 standards development projects (1547 series) and activities under discussion by SCC21 Work Group members.

Current P1547 Interconnection Projects

Title	Scope & Purpose
P1547 Draft Standard for Interconnecting Distributed Resources with Electric Power Systems.	• This Standard establishes criteria and requirements for interconnection of distributed resources (DR) with electric power systems (EPS). • This document provides a uniform standard for interconnection of distributed resources with electric power systems. It provides requirements relevant to the performance, operation, testing, safety considerations, and maintenance of the interconnection.
P1547.1 Draft Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems.	• This Standard specifies the type, production, and commissioning tests that shall be performed to demonstrate that interconnection functions and equipment of a distributed resource (DR) conform to IEEE Std 1547. • Interconnection equipment that connects distributed resources (DR) to an electric power system (EPS) must meet the requirements specified in IEEE Standard P1547. Standardized test procedures are necessary to establish and verify compliance with those requirements. These test procedures must provide both repeatable results, independent of test location, and flexibility to accommodate a variety of DR technologies.

Current P1547 Interconnection Projects

Title	Scope and Purpose
P1547.2 Draft Application Guide for IEEE Std. 1547 for Interconnecting Distributed Resources with Electric Power Systems.	• This Guide provides technical background and application details to support the understanding of IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems. • This document facilitates the use of IEEE 1547 by characterizing the various forms of distributed resource technologies and the associated interconnection issues. Additionally, the background and rationale of the technical requirements are discussed in terms of the operation of the distributed resource interconnection with the electric power system. Presented in the document are technical descriptions and schematics, applications guidance and interconnection examples to enhance the use of IEEE 1547.
P1547.3 Draft Guide for Monitoring, Information Exchange and Control of Distributed Resources Interconnected with Electric Power Systems.	• This document provides guidelines for monitoring, information exchange, and control for distributed resources (DR) interconnected with electric power systems (EPS). • This document facilitates the interoperability of one or more distributed resources interconnected with electric power systems. It describes functionality, parameters and methodologies for monitoring, information exchange and control for the interconnected distributed resources with, or associated with, electric power systems. Distributed resources include systems in the areas of fuel cells, photovoltaics, wind turbines, microturbines, other distributed generators, and, distributed energy storage systems.

P1547 Table of Contents

INTRODUCTION

1.0 OVERVIEW (Limitations – 10 MVA or less)

2.0 REFERENCES

3.0 DEFINITIONS

4.0 INTERCONNECTION TECHNICAL SPECIFICATIONS AND REQUIREMENTS

5.0 INTERCONNECTION TEST SPECIFICATIONS AND REQUIREMENTS

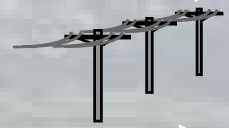
Annex A : Bibliography

NREL DER Test Facility

NREL Distributed Power Testing Capabilities

3 AC Buses

Wind Turbines



Utility Grid

Inverters

3 DC
Buses